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## Radiographic Threshold Detection Levels of Aluminum Weld Defects

A test program, used in the design and fabrication of special graduated aluminum penetrameters, has been reported. The program was also used to evaluate the threshold detection capabilities of a fixed radiographic technique in detecting surface and sub-surface cracks in one-quarter inch 2014-T651 aluminum welds. Tapered slits of predetermined dimensions were selected to simulate aligned weld cracks by bonding the penetrameters to the centerline of the weld of a matched set of weld test plates. Penetrometer thicknesses of 0.000, 0.002, 0.003, 0.004, and 0.005 inch were used to simulate crack depth. Equally thin hole-type penetrameters containing eight holes with diameters varying between 8T and 0.2T were also prepared to determine the smallest hole image resolvable under the fixed radiographic technique. Test variables evaluated included hole and slit depths between 0.001 and 0.005 inch, the location of the penetrometer within the test plates, and x-ray beam angles of 0, 5, 10, 15, and 20 degrees. A total of 80 radiographs were taken, employing the same radiographic technique, equipment, and materials in all cases. The radiographic films were evaluated by five highly competent film interpreters,

and the threshold detection capabilities of the fixed radiographic technique were defined and compared in terms based on relationships between minimum detectable width, depth, and length of the slits and the maximum radiographic sensitivities achieved for the graduated hole penetrameters.

### Note:

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### Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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